

**WHAT IS CLAIMED IS:**

- 1 1. A method of exposing a target material to an ion beam in an ion implantation system, the  
2 method comprising the steps of:  
3 quantifying an amount of ion beam neutralization; and  
4 controlling a characteristic of the ion beam of the implantation system based upon  
5 the amount of ion beam neutralization.
- 1 2. The method of claim 1, wherein the target material is a semiconductor substrate.
- 1 3. The method of Claim 1, wherein the target material is any substance to be implanted  
2 using the ion beam.
- 1 4. The method of claim 1, wherein the step of quantifying is conducted by a first device  
2 capable of detecting an ion beam and a second device capable of detecting an ion beam.
- 1 5. The method of claim 1, wherein a characteristic is selected from a group consisting of:  
2 beam current, beam energy, beam scan rate, vacuum, gas pressure, and ion dose.

- 1 6. The method of claim 1, wherein the step of quantifying includes:  
2 determining a reference ratio at a first ion beam current at a first location of a  
3 processing chamber and a second location of a processing chamber, wherein  
4 the first location is further from a first target of the ion beam than the second  
5 location;  
6 determining a current ratio of a second ion beam current at the first location and the  
7 second location, wherein the second ion beam current is being used to  
8 process a second target;  
9 determining a charge neutralization component of the ion beam at the second target  
10 location based on the reference ratio and the current ratio.
- 1 7. The method of Claim 6, wherein the reference ratio is determined when a relatively high-  
2 level, stable vacuum exists along the ion beam line and no target material is present.
- 1 8. The method of Claim 6, wherein the reference ratio is determined at the beginning of  
2 implantation when a relatively high-level, stable vacuum exists along the ion beam line  
3 and target material is present.
- 1 9. The method of claim 1, wherein the step of controlling includes:  
2 modifying the ion dose based upon the charge neutralization component to create a  
3 total dose; and  
4 adjusting a process parameter based on the total dose.
- 1 10. The method of claim 9, wherein a process parameter is selected from a group consisting  
2 of: beam current, beam energy, beam scan rate, vacuum, gas pressure, and ion dose.

- 1 11. The method of Claim 4, wherein the second device is fixed in place and sited adjacent to  
2 the target position.
- 1 12. The method of Claim 4, wherein the second device is moveable and sited adjacent to the  
2 target position during measurement.
- 1 13. The method of Claim 4, wherein the second device is fixed in place and sited behind the  
2 target position.
- 1 14. The method of Claim 4, wherein the second device is moveable and sited behind the  
2 target position.
- 1 15. The method of Claim 4, wherein the second device is sited along the beam path to the  
2 target position.
- 1 16. The method of Claim 6, wherein the reference ratio is in the range of approximately  
2 100:1 to 1:1.
- 1 17. The method of claim 16, wherein the range of the reference ratio is dependent upon the  
2 location of the first device with reference to the second device.
- 1 18. The method of Claim 16, wherein the reference ratio may be a previously stored value  
2 retrieved from control software.

- 1 19. A system comprising:  
2 memory;  
3 a processor operably connected to said memory;  
4 a program of instructions, said program of instructions including instructions to  
5 manipulate said processor to:  
6 quantify an amount of ion beam neutralization; and  
7 control a characteristic of the ion beam of an ion implantation system based upon the  
8 amount of ion beam neutralization.
- 1 20. The system of claim 19, wherein the step of quantifying is conducted by a first device  
2 capable of detecting and ion beam and a second device capable of detecting an ion  
3 beam.
- 1 21. The system of claim 19, wherein a characteristic is selected from a group consisting of:  
2 beam current, beam energy, beam scan rate, vacuum, gas pressure, and ion dose.
- 1 22. The system of claim 19, wherein the step of quantifying includes:  
2 determining a reference ratio at a first ion beam current at a first location of a  
3 processing chamber and a second location of a processing chamber, wherein  
4 the first location is further from a first target of the ion beam than the second  
5 location;  
6 determining a current ratio of a second ion beam current at the first location and the  
7 second location, wherein the second ion beam current is being used to  
8 process a second target;  
9 determining a charge neutralization component of the ion beam at the second target  
10 location based on the reference ratio and the current ratio.

- 1 23. The system of claim 19, wherein the step of controlling includes:
  - 2 modifying the ion dose based upon the charge neutralization component to create a
  - 3 total dose; and
  - 4 adjusting a process parameter based on the total dose.
  
- 1 24. The system of claim 23, wherein a process parameter is selected from a group consisting  
2 of:
  - 3 beam current, beam energy, beam scan rate, vacuum, gas pressure, and ion dose.